

VERSION OF AMENDMENT WITH MARKINGS TO SHOW CHANGES

The claims have been amended as follows:

1. (twice amended) An apparatus for controlling the power at the output of an internal combustion engine coupled to a continuously variable transmission, comprising:

- (a) an electric motor coupled to the output of said engine; and
- (b) a motor controller configured to operate said motor simultaneously with said engine and apply positive or negative motor torque to said engine output to maintain engine power output substantially along a predetermined operating line;
- (c) wherein, at any given vehicle speed, said motor controller and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

9. (three times amended) An apparatus for controlling the power at the output of an internal combustion engine coupled to a continuously variable transmission wherein the rate of change of ratio of said transmission is controllable, comprising:

- (a) an electric motor positioned between said engine and said transmission; and
- (b) a controller configured to vary the rate of change of the ratio of said transmission and to operate said motor simultaneously with said engine and apply positive or negative motor torque to said engine output to maintain engine power output substantially along a predetermined operating line;

(c) wherein, at any given vehicle speed, said motor controller and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

12. (twice amended) An apparatus for controlling the power at the output of an internal combustion engine coupled to a continuously variable transmission, comprising:

- (a) a generator coupled to the output of said engine; and
- (b) a generator controller configured to operate said generator simultaneously with said engine and apply positive or negative generator torque to said engine output to maintain engine power output substantially along a predetermined operating line;

(c) wherein, at any given vehicle speed, said generator controller and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

19. (three times amended) A control apparatus for an internal combustion engine driving a continuously variable transmission and a driveshaft coupled to said continuously variable transmission wherein the rate of change of ratio of said continuously variable transmission is controllable, comprising:

- (a) a generator/motor mechanically coupled to and driven by said engine;
- (b) a generator/motor controller electrically connected to said generator/motor;
- (c) a motor/generator mechanically coupled to said drive shaft;

(d) a motor/generator controller electrically connected to said motor/generator;

([d]e) a battery electrically connected to said generator/motor controller and said motor/generator controller;

([e]f) said generator/motor, said generator/motor controller, said motor/generator, said motor/generator controller, and said battery comprising said continuously variable transmission; and

([f]g) a controller configured to vary the rate of change of the ratio of said continuously variable transmission and to operate said generator/motor simultaneously with said engine and apply positive or negative generator/motor torque to said engine output to maintain engine power output substantially along a predetermined operating line;

(h) wherein, at any given vehicle speed, said motor controller and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

20. (three times amended) A control apparatus for a vehicle having an internal combustion engine driving a continuously variable transmission, wherein said continuously variable transmission has an output driving a first wheel at a first end of said vehicle wheel, and wherein the rate of change of ratio of said continuously variable transmission is controllable, comprising:

- (a) an electric motor driving a second wheel at a second end of said vehicle;
- (b) a motor controller electrically connected to said motor;

- (c) said motor coupled to said transmission through a road surface; and
- (d) control means for varying the rate of change of the ratio of said continuously variable transmission and for operating said motor simultaneously with said engine to apply positive or negative generator/motor torque to said engine output to maintain engine power output substantially along a predetermined operating line;
- (e) wherein, at any given vehicle speed, said control means and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

21. (three times amended) A control apparatus for a vehicle having an internal combustion engine, an electric motor coupled to said engine and driving a continuously variable transmission, and a battery system powering the electric motor, comprising:

a motor controller electrically connected to said electric motor;

wherein said motor controller is configured to operate said motor simultaneously with said engine and apply positive or negative motor torque to said engine output to maintain engine power output substantially along a predetermined operating line;

wherein said predetermined operating line comprises an ideal operating line as determined by empirical testing of the electric motor and battery system;

wherein, at any given vehicle speed, said motor controller and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

22. (three times amended) A control apparatus for a vehicle having an internal combustion engine and an electric motor, wherein said internal combustion engine and said electric motor are coupled to a continuously variable transmission, and wherein the rate of change of ratio of said continuously variable transmission is controllable, comprising:

- (a) an engine controller mechanically connected to said internal combustion engine;
 - (b) a motor controller electrically connected to said electric motor; and
 - (c) control means associated with said engine controller and said motor controller for varying rate of change of the ratio of said transmission and for operating said motor simultaneously with said engine to apply positive or negative motor torque to said engine output to maintain engine power output substantially along a predetermined operating line
- (d) wherein, at any given vehicle speed, said control means and said continuously variable transmission can vary engine speed and power, and thus acceleration or deceleration of said vehicle, without changing vehicle speed.

REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendments and discussion presented herein.

1. Rejection of Claims 1-22.

Claims 1-11, 21 and 22 were rejected under 35 U.S.C. §103 as being obvious in view of the combined teachings of Ibaraki et al. (U.S. No. 6,098,733) and Ibaraki et al. (U.S. No. 5,789,882). Claims 12-18 were rejected as being obvious in view of the combined teachings of Yamaguchi (U.S. No. 5,806,617) and Ibaraki et al. (U.S. No. 5,789,882). Claims 19 and 20 were rejected as being obvious in view of the combined teachings of Yamaguchi et al. '617, Kawakatsu et al. (U.S. No. 4,470,132) and Ibaraki et al. '882. In support of each of the grounds for rejection, the Examiner states that one of ordinary skill in the art would find it obvious to operate the motor and combustion engine simultaneously.

In an effort to expedite prosecution, the Applicant has carefully considered the Examiner's grounds for rejection and has amended Claims 1, 9, 12, 20, 21 and 22 to recite an aspect of the invention that clearly distinguishes the invention from any of the cited references. These amendments are made by the Applicant without disclaimer or prejudice to filing a continuation application directed to the subject matter of the claims prior to the amendment herein, and without waiving the possible traversal of the rejection set forth in this Office Action as applied to those claims.

More particularly, each of those claims has been amended to recite that (i) the invention is limited to use in combination with a continuously variable transmission, and (ii) the controller (or control means) and the continuously variable transmission vary

engine speed and power, and thus vehicle acceleration and deceleration, without changing vehicle speed.

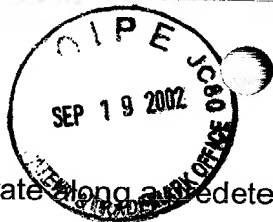
Note that this is a substantial departure from the configuration and operational control of the systems in the cited references. In the cited references, discrete transmissions are employed. While the ratio of the transmission may be able to be changed, the ratio is not continuously varied. Therefore, while the engines in the cited references may be able to operate along an ideal operating line (IOL) as engine speed varies, they are not able to operate along the IOL as the power varies because fixed ratio transmissions are used. In contrast, as recited in the Applicant's amended claims, a continuously variable transmission (CVT) is used. The Applicant's controller, in combination with the CVT, allows us to, at any given vehicle speed, vary engine speed according to demand by the driver for power. This is reflected in the additional recitations of a CVT in the preamble and the following limitation in the body of the claims: wherein, at any given vehicle speed, said motor controller and said continuously variable transmission can vary engine speed and power, and thus acceleration and deceleration of the vehicle, without changing vehicle speed.

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Note that this approach is fundamentally different than the approach in the cited references where fixed ratio transmissions are used. Shifting the CVT ratio (which is continuously shiftable as opposed to being limited to shifting among selected fixed ratios), essentially allows the engine to move up and down the IOL without a resulting change in vehicle speed because the CVT changes ratio to maintain the vehicle speed while allowing the engine speed to vary according to the power demanded. Therefore, the engine output can be varied without having to change vehicle speed and the engine

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can operate along a predetermined horizontal IOL in the torque/speed plane as described in the specification and shown in the drawings.

2. New Claims 23 and 24.

The Applicant is presenting new Claims 23 and 24 to recite the invention in additional forms. Claim 23 is written in means plus function form and is entitled to interpretation under In re Donaldson. Claim 24 is presented in Jepson form. Both claims recite subject matter which is novel and nonobvious in view of the discussion above.

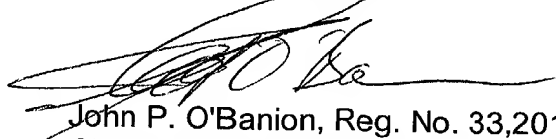
3. Conclusion.

In view of the foregoing, the Applicant respectfully submits that each of the pending claims is now in a condition for allowance. None of the references, singly or in combination, teach, suggest or provide motivation or incentive for the invention as recited in the pending claims. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

The Applicant also respectfully requests a telephone interview with the Examiner in the event that there are questions regarding this response, or if the next action on the merits is not an allowance of all pending claims.

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Respectfully submitted,


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